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A FEW NOTES ON REMOTE OPHTHALMOSCOPIC DIAGNOSIS*

A. M. Skeffington, Opt. D., D. O. S., F. A. A. O.
Chicago, Ill.

During the past several years I have frequently used a certain phrase. At times I have perhaps been misinterpreted but I am convinced that in time the members of the optometric profession will see the matter as I do. This phrase is, "That optometry shall become the group to whom is allocated all eye diagnosis." My reason for believing that such a condition is necessary is as follows:

For the past two decades, at any rate, because that is as far as my experience goes, we have been asking the layman on the street to do his own diagnosing. We have had a dual handling of a single job, for we have said, "Tom, if your eyes bother you, and you need a pair of glasses, go one way; if you do not know, and think something else may be wrong, go the other." I contend that is an error. To some one group must come the work of primary diagnosis in determination of eye problems, and it is up to that group, whichever it may become, to decide what may be done to that particular case. And as we see the problem today, optometry must take it upon itself to see to it that any uncomfortable pair of eyes is made comfortable.

Dr. Tait said that he does not yield the moral right to any other group to do refracting. That statement needs no comment from me. I do contend that it is not alone our moral, but legal, right to determine as far as it is possible to determine in primary diagnosis, the needs of a pair of eyes.

I need not say to you that is involving a much broader diagnostic knowledge than has hitherto been required. The past two years in graduate clinical groups have been illuminating to a degree. It has been said that we have here at this meeting the pick of the pro-

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fession, and except for a few absentees, who could not get away, I think that is undeniably true. You men sit at your offices, in your practice, in a more or less—and I am not speaking desparingly—a rarified atmosphere in the profession, and are not in contact with the little fellow, and that little fellow will and must come up to higher educational standards.

Forty-four clinical groups in the past year have worked with me. In each of those we have demanded of each individual some time during the week, as far as is possible, a complete opthalmoscopic examination of a patient. The ophthalmoscope is a vital part of our analysis of a case.

I am not in this discussion even remotely interested from the optometric viewpoint in such obvious things as the detached retina, and advanced case of choroiditis of any type. I am not even interested after a case has reached the point of primary atrophy. They are beyond my help, and beyond the help of most anybody else as far as merely caring for the eye is concerned, except perhaps in certain efforts that are being made surgically to handle detached retina. I am interested in the minutia of ophthalmoscopic examination.

It is almost impossible to get an accurate diagnostic picture merely by having the patient sit bolt upright and peer off at some distant point with the refractionist sitting bolt upright with his ophthalmoscope gripped in his right hand peering into the right eye.

I will not go into the technique of the ophthalmoscope this afternoon at all, but attempt to bring in a background for the things we are interested in.

It has been my contention that no one finding in an ophthalmoscopic examination has any value by itself at all. It is merely an indication, nothing more. Any book on the ophthalmoscope will start in by giving us shape, size, color, etc., of a nerve head, and yet no man can accurately describe the color. I doubt if we can definitely state the size of a normal nerve head, and by normal I mean one not pathologically involved. Nor can we determine shapes. They seem to vary as all things vary. We are interested, however, in the appearance of it, in so far as any pathological involvement may be indicated.

In a recent book on the ophthalmoscope a proper differentiation has been made. In speaking of a neuritic condition, the author draws a line of demarcation between the choked disc which is, of course, a neuritic, and any other papilledema that may exist in the eye. And the line of demarcation he draws is that any blurring or any "wooliness" of the periphery of the disc is a neuritic condition. Any of you using the perimeter in your examination today will learn that the

papilledema will usually reflect itself in the picture of the blind spot in the perimeter. We are coming to believe that any condition of the human body affecting the comfort applied to the eye or available to an eye will reflect itself in the ophthalmoscopic picture. It seems to be that any foci of infection existing in the body sufficiently acute to produce discomfort, or manifestations in the neural flow, will give a picture somewhere of a wooliness of the disc. Please note I said, "it seems to be." I also believe that certain conditions in the body produce certain stigmata which are quite definite, and I also believe that whenever the upper nasal segment of a disc is blurred, in other words, whenever there is a papilledema of the upper nasal segment coupled with an engorgement of the veins and an attenuation of the arterial system, that we have a picture of some type of intestinal stasis.

It has already been mentioned by Dr. Hathaway, that an esophoria may be and usually is an exophoria. Suppose we carry that one step farther and say an apparent orthophoria is a diagnostic esophoria. If an individual, highly stimulated by effort, the effect of which is brought on by a toxic condition, can change himself from an orthophore to an esophore, it is quite obvious that the individual whose placement might have been, for instance, a four degree exophore can be changed to a one degree exophore or an orthophore.

The position of a pair of eyes, as manifested by a phoria test, is "merely the placement of a pair of eyes by the brain conditioned by habitual fatigue." Consequently on your ophthalmoscopic picture will necessarily rest some of the analysis in your case that you make from your phoria and duction findings, a deduction which cannot possibly be left out of consideration. A duction is not a picture of muscle power, that is absurd on the face of it. Any man who has worked with the Kratometer knows that.

Dr. Tait in his research work in Pennsylvania has shown how you can build a duction up in almost no time, if you will begin to get a stimulation alone in narrow paths. "A duction is merely a measure of the amount of innervation being supplied a given function by the brain at a given point of stimulation, and much more important at a given time." The time element has been left out of a good deal of our optometric diagnosis.

In considering the case according to its phoria, before you say this man shall have such and such a thing done because of his exophoria, you must first say what time of the day did you take those findings. The exophore at 9 in the morning may be an esophore at 3 in the afternoon, and vice-versa.

Have you ever attempted to take a picture of the result of vari-

ous types of toxins? I spoke of this being a picture of intestinal stasis. I think I am willing to stand on this thing. We, of course, will find errors. When you are dealing with part of the human body, out of the realm of physics and mathematical formula, undoubtedly there will be conditions which come up that will tend to nullify that as a universal statement, and I am not making it that way. We think with this wooliness around the disc we have a picture of intestinal stasis but remember there is more than one stage in intestinal stasis.

Supposing you have an amenable patient on your hands who has been determined to have an intestinal stasis. If you can have him so handled that you can get a relieving of that intestinal condition over a period of time, I advise you to take his ductions and phorias at different times during this period of alteration of the toxic condition. I have just come from a marvelous picture of that in one of the clinics, where a man was having all sorts of difficulties, and was putting himself on a seven-day fast. I got there on the third day of this fast. We kept check on his ductions and phorias. We got almost every known phoria you can imagine a pair of eyes having, almost every duction finding that can be visualized over a period of five days. Which one are you going to rely upon? Now, that is what I am thinking of in this matter, and in the analysis and linking up with the optometric examination of your remote ophthalmoscopic diagnosis.

In Winnipeg at the clinic we had a patient and this particular individual showed me the nicest fundus I ever saw and yet I found him an esophore and he persisted in remaining an esophore. That meant to me something besides an immediate pathological condition. My remote ophthalmoscopic examination of this patient meant that I could take acute pathology out of my diagnosis. In another the son of a very well known optometrist there came to the clinic as a patient and gave us an absolute picture of a general toxic involvement of the body. We had a perfectly defined nerve head, we had a rather enlarged vein condition, and a grayish fundus, I don't know how to express it except to call it a light mouse gray. With the picture of that eye ground in mind we went on with the examination. He had no refractive error to speak of, was practically orthophoric, but his reversion back to fusion was extremely low. When we came to take his vertical ductions they would give us anything; we would get four, six, eight and so on, but there was no vertical phoria manifested.

We said, "This man is about to be very ill." One of the candid men of the group said, "That is a poor diagnosis. There is nothing wrong with him. He has been on the high school track team until recently, when he had to quit on account of his eyes, and he is now

driving a truck. You can't find anything, so you say there is something wrong with him pathologically."

After I was gone this doctor took his son to one of the clinics; they went over him again and said there was nothing wrong with the boy, sort of run down, that was all.

The doctor came to me last June and said the boy had been in bed since March, had had two operations and was facing another, and only of late has the boy come to the point where he is again about to take his place in the world. He was an orthophore. He had a certain amount of neural power there to innervate his ductions, also, his reversion back to fusion was low, but the remote ophthalmoscopic diagnosis definitely gave reason for determination of the diagnosis which was made, counting as negligible the manifest findings available at that time.

I have spoken of the fact that each eye has an arterial system. Any book on the anatomy of the eye will warn you to watch for the pulsing of an artery. This is good, and I advise the use of the Dean technique. Trail out the artery to the first branching and count the pulse beats, and if we find a pulsing of the artery I believe we have a patient with a heart involvement. If you go into it, you will find your individual with a heart involvement will give a different picture, if the involvement of the heart is primary or secondary, and if it is secondary you have a toxic involvement that will nullify your phoria finding. If it is primary, one is forced to wonder if that patient will live long enough to get away from your office. One of the doctors at Hartford, after the clinic of last year, picked up two cases of this type, one of whom lived less than two weeks, and one who is still living.

In the same book on anatomy, you will find mention of the pulsing vein, but stating this has no pathological significance. However, I would like to have you watch this particular point. When you find a pulsing vein, which is notoriously non-pathological, get in touch with your laboratory man and have an analysis made of the content of the upper colon. That pulsing vein has a qualitative factor back of it, it is not pathological from the ophthalmologists's viewpoint, there is nothing he can do with it from the eye angle, in fact there are few things that bother the eye that the ophthalmologist can handle from that angle alone.

One of the most amusing things I encounter is the frequent recommendation in iritis that the patient be given sweat baths. It doesn't strike me as being normally the equipment of the ophthalmologist's office, but that individual, early in the manifestation of his difficulty, comes to the optometrist and says, "My eyes are bothering me." Here is what I would like to leave before you.

When a refraction shows manifest difficulty we say to this patient who may be forty-six years old, "It is time you came in." We put that lens on without saying to ourselves, "Why did he manifest difficulty in the last few months?" He has not suddenly aged.

In Philadelphia an individual was brought to the clinic. He was an architectural draftsman who had worn the same formula in comfort for fourteen years and three months, before had become suddenly uncomfortable. He had five pairs of glasses, all prescribed since that time. We found a tubular field of hysteria. I need not tell you his fatigue fields were all low. I need not tell you the five pair of lenses were hopelessly impossible from the angle of giving him comfort. Fourteen years comfortable, and suddenly manifesting difficulty. There is always a problem back of the sudden manifestation of difficulty. That does not mean he is not to have his proper correction given him but it does mean to go back of that and find out why he is having his difficulty.

I am very interested in Dr. E. E. Hotaling's work during this past year on diagnosis from the diabetic angle. We must more fully realize the number of patients with diabetes who come to the optometrist first with eyes uncomfortable and later, after they have had the lenses, go on into diabetes. In one of the recent clinics, we picked up the nicest case of diabetes you can imagine, and he manifested sugar, and we immediately put him on a provocative medication, then he will be put on his diet. He said to me, "I would like to have you examine my eyes before I get away. I have been having a lot of discomfort the last three or four years." I needn't tell you he had a number of pairs of lenses, etc. The thing I am striving for is the first diagnostic picture of trouble in any pair of eyes. I am interested in this primary, this remote, this early manifestation in the fundus of all the various conditions, and I believe that with the ophthalmoscope, and particularly with the red free technique, early in the manifestation you pick up at least an indication of abnormality.

I have said that I believe early in this onslaught of the various types of kidney problems, we pick up signs of the conditions in the macular area. I hesitate to call them exode. Perhaps that it too definite, but any abnormality of the fundus is indicative of trouble. Take, for instance, your tesselated fundus. In the nasal area it shows more easily. I mentioned the fact that when we had our blurred nerve head we had intestinal stasis, and I spoke of the fact that there were different stages of that. Dr. T. A. Brombach in San Francisco has put them into a scale and calls them two different types, one stimulative and one depressive. I know of no better terminology.

Any abnormality of the fundus is diagnostic. We have been watching in the past year such hitherto considered wholly bland conditions as that one which is known as Gunn's Dots. It is idiopathic. It is labeled as being non-pathological entirely. There is no way of medicating it, and yet in each individual manifesting it we have found again our lower innervation to our ductions, and abnormal perimetric pictures. That means that in these cases we will have to give different interpretation to the duction and phoria findings manifested.

Consider the young patient who comes in to you, seven or eight years old, and tells you the teacher says he must have glasses. The child has a subnormal visual acuity, not able to get quite 20/20. Patient is able to see fairly well, but not quite normal. He is not myopic and his vision cannot be improved by optometric means. This is apt to be an hereditary problem and in most instances one would find peripheral choroidal manifestations. I will not call them spots yet if one examines these cases closely you will find abnormalities in the peripheral parts of the fundus. Wasserman tests should be made on these cases.

In closing, if the ophthalmoscopic picture carries with it a clean cut and normal appearing nerve head and a normal ratio between artery and vein, and eye ground unmarred by deviation from the normal, then as we take our duction and phoria findings, on them we can place the reliance that that is the amount of innervation being supplied by the brain, it is liable to be more or less unvarying and consequently, dependable.

On the other hand, the minute that our first finding, which is an ophthalmoscopic finding, shows a pathological problem of any intensity, or to put that differently, any variant from the normal, every finding made in the examination must be given an interpretation in the light of that ophthalmoscopic picture. What I want to bring to you is the fact that the ophthalmoscope which has always been considered a negative instrument in the sense that it told us what merely not to do, is an absolutely positive instrument in that it is a guide and a sign as to the interpretation that may be placed on subsequent findings.

DR. A. M. SKEFFINGTON,
C-O PALMER HOUSE,
CHICAGO, ILL.

DYNAMIC SKIAMETRY*

N. Levin, Opt. D.
Chelsea, Mass.

I have noticed that, of late years, dynamic skiametry has lost its past charms, and we seldom now find those lively discussions on this subject. To some practitioners dynamic skiametry is a closed book and all its problems are solved for good, while others are still waiting for some Einstein or the future generations to unravel this great mystery. The two articles, which have recently appeared in the American Journal of Optometry, presenting Tait's new system, I believe, will set the readers to do a little hard thinking. Tait presented the statistical tabulations of 1,100 cases: a laborious and tedious task of a number of years, for which Optometry owes him a great debt. He has shown that the quantity of the physiological exophoria bears a direct relation to the amount of deduction from the relative negative accommodation. He defines physiological exophoria as the difference, in the findings of the phoria tests, between distance and near. Relative negative accommodation is the total acceptance of plus by fogging and reducing it down to the first point after reversal. In the first six prism diopters of exophoria each prism diopter represents a deduction of .25 D. lens value or a total of 1.50 D. For all the exophoria over six a deduction of .25 D. for every two prism diopters of exophoria. Thus, a physiological exophoria of 8 diopters represents a deduction of 1.75 D. and 10 prism diopters represents a deduction of 2. D. and so on. These figures are based on mean averages and it is what it should be expected in every case but not to be taken as absolute. We note the gradual rise in the amount of the deduction by the different authors; from no deduction by Cross, to a deduction of .75 D. by Sheard, to a 1.50 D. by Bestor, to .50 and 40% by Wool and Atkinson, to a minimum of 1.50 and a maximum of 3. by Tait.

A close study of the plotted curves presented by Tait shows that some modification must be made to the interpretation of the same. Figure 1 is a reproduction of Whitaker's graph 1, (page 498) or Tait's figure 3 (page 688). Whitaker's explanation of these curves is as follows: "A manifestation of the plus lens power before the eye is due to a lack of accommodation in the eye. This plus power amounts to 1.50 D. between the ages of 10 and 40 years and consists graphically of two curves which may be found in any book on Physiological Optics, known as the lag of accommodation behind convergence curve and the ciliary tonicity curve." Will the author be so kind as to give the name of the book or books to which references were made in the quoted paragraph. The most interesting part of his analysis reads: "Now I want you to notice something very important. Draw these two curves on the same paper and see what the value of the

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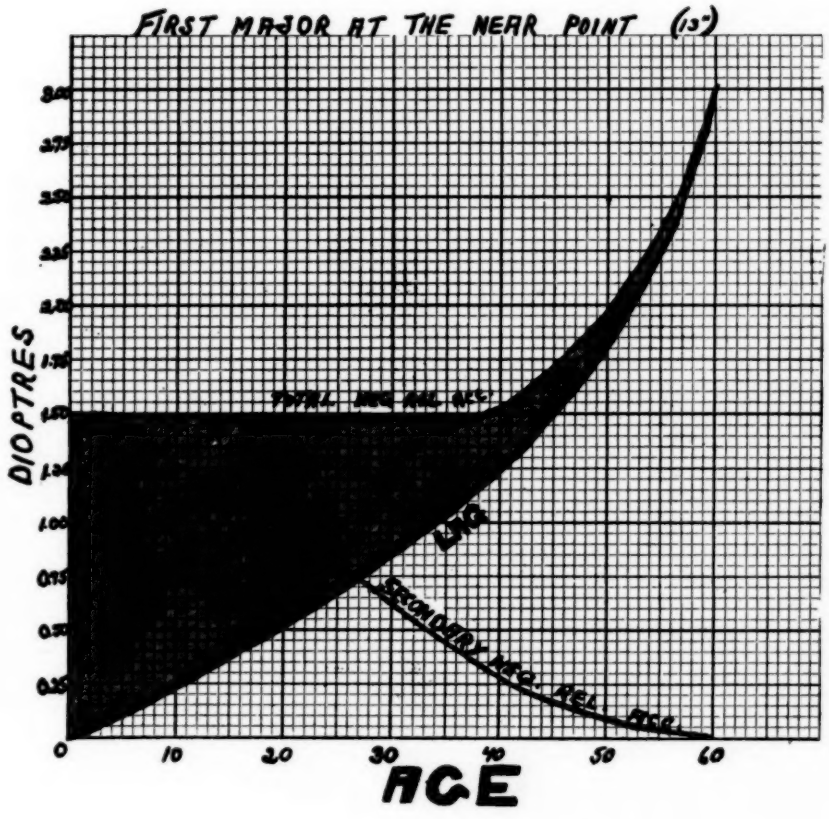

FIGURE NO. 1. [Reproduced from Americal Journal of Optometry Vol. 6, p. 498. The Tait Dynamic System of Skiametry by A. C. Whitacre.]

sum of the curves between the ages of 10 and 40 years becomes. You will find this to be 1.50 D. In this graph, Number 1, there are two variables of diopter and age. The two curves (both the lag curve and the secondary negative relative accommodation curve) are functions of the age. The third curve is the total of the other two curves. The shaded portion represents the difference between the 'high point' or 'first fast against' and the 'low point' or 'first fast with' motion."

The logic of the above reasoning sounds to me the same as we would say that a plus six with a minus four equals ten, because six and four are ten. The lag curve and the secondary-relative curve are not only opposite in direction but they are also opposite in nature, one denotes the weakness of the ciliary and the other its strength, and a third curve cannot be expressed by the sum of the two but either by the difference of the two or a mean constant may be drawn which will correspond with the .75 D. line.

Tait explains the same graph in a more rational form but it is very difficult to accept. He claims that the total relative negative curve is established by his fogging method or high point of neutralization and the lag curve by the low point of neutralization. The third curve, or secondary negative, represents the difference between the other two. We note that the total relative negative curve is constant while the lag curve is variable with age. What explanation can we offer on this. The third curve does not explain anything, it rather proves the inconsistency between the other two curves; it shows that when the lag is 1.25 D. and the ciliary tonicity is .25 D. the total lack of accommodation equals 1.50 D. and when the lag is .25 D. and the ciliary tonicity is 1.25 D. the total lack of accommodation also equals 1.50 D.

There is truth in the total relative curve, as it will be shown later that Sheard's physiological lag of .75 D., Bestor's physiological deduction of 1.50 D. and Tait's total relative curve are all one and the same. But the lag curve and the secondary relative curve are, to my mind, based on a misapprehension of the shadow movements. To my observations the so-called neutral area, which is presented in the graph by the shaded portion, is not a variable factor with age. The presence or the non-presence of a neutral area, in each and every pair of eyes, is directly depended on the stability or fixity of the state or condition of the eyes. A neutral area is common in children as the condition is more or less unstabilized before it is fully developed. It is not present in eyes which have been well corrected for some time, as the state of the eyes becomes fixed. It is present in uncorrected ametropia, as the attempt to compensate for the ametropia puts the condition of the eyes into an indefinite state. It is more common in hyperopia than in myopia, as the attempt to compensate in myopia is not so common as in hyperopia. It is one of the signs in myopia as to the presence or non-presence of compensation.

In his classification of the cases Tait does not make any distinction between the corrected and the uncorrected ametropic eyes. By noting the presence of a neutral area in children and the non-presence of the same in adults with well corrected eyes, we can readily see how the conception will strike the observer's mind that there is a symmetrical curve of a neutral area gradually rising and diminishing with age. The fact that he changed his method to fogging shows that he recognizes the existence of unstabilized conditions in many cases, then why did he put on the graph that this phenomenon is purely a variable factor with age. A physiological accommodative lag, which is variable with age, does exist and it cannot be proven directly by any of the means we have but it can be proved by deduction.

Before we extend our discussion on this subject it will be well to give a brief survey of some of the explanations on dynamic skiametry, and they will be presented in their historical order as they are viewed by the writer. The original explanation as given by Cross and his commentators is that the effect of plus lenses relaxes the accommodation which is over and above the physiological locked relationship between the convergence and accommodation and makes the latent hyperopia to become manifest. The full correction as shown by the test should be applied. Let me remind

the reader that at the time when Cross gave this test to optometry the prevailing idea was that all eyes were afflicted with spasm of accommodation, and our medical friends insisted that the only means to break the spasm is drops. Cross' method was accepted, with great enthusiasm, as a physical means to break the spasm of accommodation and it was to be used, principally, for children. The first article which started the controversy about this test, I believe, was "Pitfalls in Dynamic Skiametry" by Hotaling. The writer as well as others objected to the principles of this test on the following grounds: first, the effect of plus lenses is to make the eye static and the term dynamic does not apply; second, a physiological locked relationship between convergence and accommodation does not exist in the abstract, and as we are examining ametropic eyes the relationship between convergence and accommodation is no longer physiologic to have any effect on the test. Eberhard devised the reflectoscope and stresses the point that the value of the test is in the difference between the static and dynamic which shows the lenticular assistance required for near.

Sheard accepts Eberhard's explanation as to the value of the test in general, and interpretates the findings of the plus values as the relative negative accommodation with no direct bearing on the latency of the hyperopia.

Robert Minturn Lockwood (the late editor of the Optical Journal) points out that there are two types of subnormal accommodation; the inefficiency or latent type and the insufficiency or manifest type.

The writer points out that dynamic skiametry shows that there is an inefficiency or a latency which is "not corrigible" by lenses.

Sheard discovers a "with" movement, between .50 and .75 D., in emmetropic eyes. As the term inefficiency cannot be applied to the physiological states he adapted a noncommittal term and called it "accommodative lag." He claims that this physiological lag should be deducted from the findings, and the value of the test is for near.

Bestor doubts the existence of relative negative accommodation, that is, the term "relative" should not be applied. He accepts the original explanation by Cross that the findings of the plus values is the latency of hyperopia, and the reason it cannot be applied in full is because of tonus contraction. He claims a physiological deduction of 1.50 D. should be made from the findings, and the value of the test is for general refraction. He points out that the amplitude of accommodation is inversely proportional to the amount of the plus shown by the test.

Tait accepts the claims of Sheard and Bestor with some modifications and shows that there exists a relationship between the findings of the phoria test and the amount of the deduction, as explained before. He has hinted that the accommodative lag has a direct bearing to presbyopia.

There are certain indisputable facts which may be taken as a bases for our reasoning in order to determine the true meaning and interpretation of this test, and they may be enumerated as follows:

First. In using this test the first fact, which is staring us in the face, is that the patient's eye sees best when there is a positive "with" movement and does not see well when this "with" movement is neutralized.

Any interpretations of this test must explain this apparent inconsistency in the primary laws of optics: when there is a with movement and the retina is not in conjugate with fixation point the eye sees best, and when there is no movement and the retina is in conjugate with fixation point the eye does not see well. Which one of the above stated explanations answers this question. To the scientific mind who is engaged in plotting curves and planning systems on an elaborate scale, this question may seem irrelevant or too insignificant to bother his mind about. The law of gravitation was discovered by the fall of an apple and the planetary system by the swing of a candlebrum. So, quite often it is the insignificant which count.

Second. All the extra "with" movements are present only in non-presbyopic cases and they are not present in presbyopia. This is an indisputable fact the truth of which can be readily demonstrated by the reader: take a presbyope, whose condition is all set, the findings of the test will practically agree with the subjective test. Any explanation of this test must show why this extra "with" movement is present in the non-presbyopic eye and is not present in the presbyope.

Third. It is agreed by all physiologists that one of the principle factors of visual acuity is the resolving power of the eye. In plain words the perfect focusing of the retina is the principle factor which determines the quality of the acuity of vision. Any interpretation of the extra "with" movement must explain that it exist in a form which does not interfere with the perfect focusing of the retina.

Fourth. From clinical observation, it has been established that in the medium and high degrees of ametropia there is a physiological deduction from 1.50 to 2. D. Bestor, Nott, Trellevan and others accept 1.50 D. Tait takes a mean average of 1.75 D. The writer accepts 2. D. for the ametropic eyes which have never been corrected before and 1.50 D. for those which have been well corrected.

In the gradual progress we have made, in the last 15 or 20 years, on the study of the problems of dynamic skiametry, we have reached a stage today where it is no longer a question—do we accept dynamic skiametry or what system to use. We are facing pecular problems about the eye which demands a solution.

It seems to me that the most rational conclusion that can be drawn from the enumerated facts is this: There exist in the physiological eye an accommodative lag which is the forerunner of presbyopia. The difference between the lag and presbyopia is similar to the difference between exophoria and exotropia or, latent and manifest. In physiological state the lag gradually rises with age until it reaches the presbyopic stage when the lag ceases to exist as latent and becames manifest presbyopia. In the non-physiological eye, the ametropia aggravates and augments the existing lag, and all the lag which is over and above a given maximum quantity is turned into manifest hyperopia, which is the accepted lens to be applied as a correction. Human health fluctuates. Nor is it the same with different individuals and the maximum quantity which can be kept under cover is different with different individuals. But when a large number of cases

are taken, collectively, they express a given quantity as a maximum which is the constant for all ages. The constant curve of the total negative relative accommodation is not an expression of age but it is an expression of the augmentation of the lag by the ametropia.

All tests by prisms and lenses such as duction, phoria and lag tests, exaggerate the actual condition of the eyes. Quantatively speaking, the tests duplicate or multiply by 2 that which exist in the actual. .75 D. lag is the ametropic constant for all ages in the actual and is doubled by the test to 1.50 D. In the physiological eye the .75 D. is the threshold for the 1. D. manifest presbyopia. This is consistent with our clinical observation. We find one diopter to be the first addition in presbyopia.

The phenomenon of the tests is an expression of a common law *as the action so is the reaction.* To explain the meaning of this: The position of the two eyes in the head creates a gap in the visual field whose width is equal to the distance between the two eyes. This gap is constantly close and opened by the convergence positive and negative respectively. When we place prisms before the eyes in the duction tests, in prism base out, the virtual direction of the rays calls on the visual centers to close the convergence gap and in return the centers signal to the subordinate for 18 prism diopters adduction or to duplicate its daily performances of convergence. Prisms base in calls on the centers to open the convergence gap and the response is 6 prism abduction or the width of the gap. The relation of three to one between adduction and abduction is merely a coincidence of our figures of measurements, the visual centers are not concerned with these figures. What concerns the centers is the opening and closing of the convergence gap. Whether the test is made with a distance or a near fixation the results are approximately the same; it just repeats its daily performances. Thus the findings of the adduction at near and the abduction at distance is double of what it exists in the actual performances of the eyes. In the phoria test the action is the conscious manifestation of diplopia, the reaction is the re-enacting or the repeating, by the subordinates, the subconscious diplopia which is daily being practiced by the eyes either as esophoria or as exophoria as the case may be. The same thing is true with the lag test, when a lag exists and the virtual direction of the lenses calls on the brain to reproduce it then the total relative negative accommodation measures the amount of the existing lag and its duplicate. In our daily performances of the eyes we constantly practice two states of vision; at those periods when the highest grade of vision is being performed the eyes are at the state of "Attention." At other periods the eyes are at their physiological state "at ease." Esophoria, exophoria, lag or excess of accommodation is being practiced by the eyes while they are at the physiological state "at ease" and their quantities may be expressed by one-half of the findings of the tests.

Let us reflect for a moment and see what takes place while the eyes are under test. For our hypothetical case we will take a non-presbyopic hyperope of two diopters, and place the correction before the eyes and approach with the mirror. Subject is conscious of the light spot on his

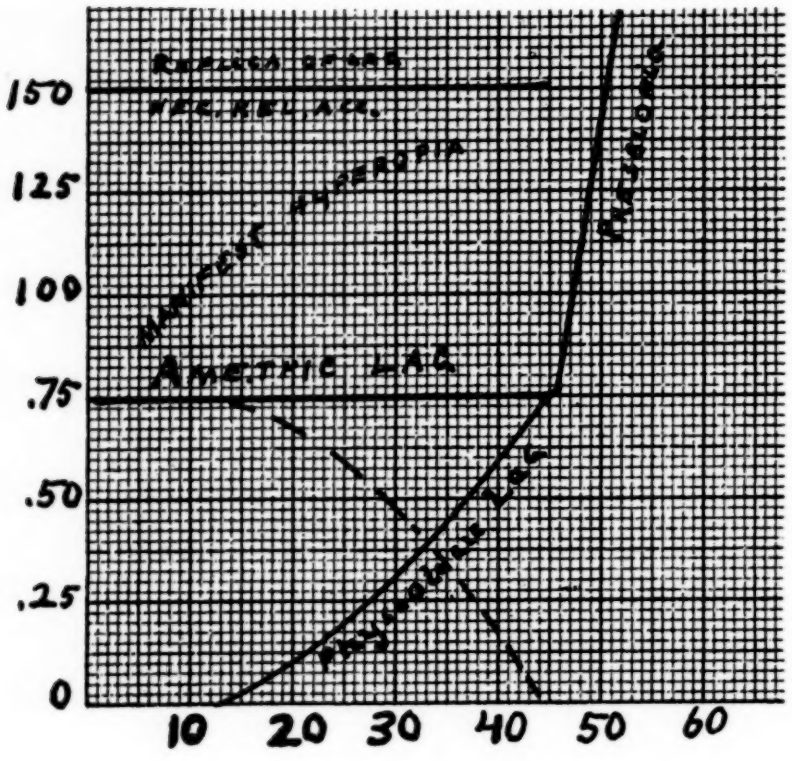

FIGURE 2. AGE.

retina, "Attention" detracted, existing lag becomes manifest and the focal plane or the conjugate of subject's retina is on plane behind the observer and the positive "with" movement is visible to the observer. Simultaneously, with the play of the plus lenses to bring the focal plane of the lag on the observer's chart, a call is made on the visual centers for more lag and the response is, in quantities which the eye has been trained by previous experience or, the replica of the existing lag.

Figure 2 explains this graphically. The total findings of plus values at the point of reversal, in the non-presbyopic hyperopic eye, is analyzed in three parts; The manifest hyperopia all above the .75 line, the ametropic lag proper or the constant of .75 D. and its replica the 1.50 D. constant The physiologic lag, which shows on the graph to turn manifest presbyopia at the age of 45, is preceded by a stage of "excess," and I placed the period of "turnstile," from excess to lag, at the age of between 15 to 20.

From another viewpoint the physiologic lag may be designated as the "period of balance." Age is a factor which produces physiological life changes, independent of ametropia. It consists of three stages of periods

namely: "period of excess," "period of balance" and "period of deficiency," and there is a "turnstile" period between the changes of the stages. The seat of the physiologic lag is in the primery reflex arc or sub-cortex, and is covered by the secondary reflex arc which arises in the volitional centers. The function of the lag is similar to the function of a small amount of exophoria, to maintain the proper exercises and control of the secondary reflex arc over the primery.

DR. N. LEVIN,
101 WASHINGTON AVE.
CHELSEA, MASS.

THREE CASES OF ANISOMETROPIA*

William Smith, Opt. D., D. O. S.
Dorchester, Mass.

The three cases presented here are from my files. Each has been carefully gone over periodically to determine the exact condition of vision and the patient's mental state since correction of the eyes has been made. As will be observed, the patient in each case was instructed to report for a check up once a week for a month and, in each case comfort was reported.

Each one of these cases wears the first correction, after going without glasses for periods ranging from five years to twelve years. In each case the usual "getting used" period was not at all experienced, this is the reason I am featuring them and my own observations which came to me in conclusion.

Case No. 1.

Mr. A. F. Peddler, age 37, had glasses some eight years ago, for constant wear, but was unable to use them as they gave him discomfort. Lids droop, suggesting a ptosis, eyes smart. Blapherospasm over right lid. A peculiar feeling—a sort of stressing over bridge of nose. Vision for near and far is not comfortable. Smokes a good deal. Muscae.

V. A. uncorrected: O. D. 1% (Ives), O. S. 20/20—Snellen.

Fundi appear healthy. Right fundus seen with—10 D. lens in apperture, left seen without any lens.

Keratometer: O. D. X-10-41½—100—43
O. S. X-10-42¾—100—42½

Static Skiametry: O. D.—9.00 D. Sph.=1.25 D. Cyl. Axis 10.
O. S.—0.25 D. Sph.

Subjectively:
O. D.—9.00 D. Sph.=1.25 D. Cyl. Axis 10.
O. S. PLANO.

Tonicity tests Distance:
7° Exophoria=3½° R. H.

Tonicity tests Near:
13° Exophoria at 13 inches.

Formula prescribed for constant use:
O. D.—9.00 D. Sph.—1.25 D. Cyl. Axis 10. 20/30 V. A.
O. S. Plano ½Δ prism base up. 20/20 V. A.

The patient lingered in my office with the trial prescription on for a half hour, in turn reading and walking and reported no discomfort. The same report came from him when the lenses were made up. I instructed him to report to me inside of a week, this he did, telling me at the same

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time that he felt no different than without them, only that his vision was much better. Some hygienic advice concluded my instructions to the patient.

Case No. 2.

Miss L. H. Secretary, age 23, had glasses when at grammar school, but has never really worn them.

Eyes blur, distant vision is not good. No trouble with near vision. Temporal headaches. Left side of face became paralyzed as a result of dental trouble. Lids burn and itch. Patient has some internal gland trouble as she is becoming stouter rapidly. Present weight is 375 pounds. (Is under medical care for this condition.)

V. A. Uncorrected: O. D. 20/25 plus.
O. S. 20/66⅔—partly.

Fundi healthy.

Keratometer: O. D. 175—41¼—85-42.
O. S.—170—40½—80-45¼.

Static Skiametry: O. D. Plano.
O. S.—3.50 D. Cyl. Axis 175.

Subjectively: O. D. Plano.
O. S.—3.50 D. Cyl. Axis 175. 20/20 V. A., O. U.

Tonicity Distance: 1° Exo.

I felt that no correct information as to the status of her near point tonicity could be had because of the facial paralysis, so I disposed with that test. I advised her to wear the glasses constantly, and to see me weekly for a month. Each report was that the glasses were very comfortable. The same advice as in case previously cited were given in this case also.

Case No. 3.

Mr. H. H., Jr. H. S. student, age 14, had glasses, but could not wear them with comfort. Left eye seems to bother more than the right. Has to squint to see clearly. Tonsils and adenoids give him a good deal of trouble.

V. A. Uncorrected: O. D. 100%.
O. S. 30%—Ives screens.

Fundi healthy.

Keratometer: O. D. 160—44½—70-45.
O. S. 25-44½—115-45¾.

Static Skiametry: O. D. Neutral at 20″.
O. S. plus 5.00 D. Sph.

Dynamic Skiametry gave me nearly the same findings.

Subjectively—fogging method during which I placed a 20 D. lens as a fogging means.

O. D. Plano—20/20.
O. S. Plus 5.00 D Sph. 20/25 V. A.; O. U. 20/20 V. A.

Weekly investigation showed no trouble whatever in wearing of prescription. Advised use of left eye as much as possible for both distance and near. Also advised to see specialist about his tonsils and adenoids.

I instructed him to wear the glasses constantly.

It seems that each of these cases responded quite well to full correction at the first time. The variation in each case was considerable. In each case I explained to the patient the nature of the error and the usual procedure in correcting it. I told them that their case requires watching and in cases of discomfort, new lenses—which would correct the errors partly, would be indicated.

I have observed in a good many cases of Anisometropia (and Antimetropia) that the patient will readily accept full monocular correction, no matter how high the error is, if the corneal curvatures of both eyes are alike, or nearly so, but may feel uncomfortable when there is a variation in corneal curvatures of both eyes. Thus, for example, if the right eye cornea is in the same range of curvature as is the left, full correction of each eye will be tolerated; but if there is a noticeable variation, such comfort will not be experienced. The exact amount of variation is a matter of uncertainty.

It is, however, advisable to watch conditions of Anisometropia in which the corneal readings are variably different—say—around 43 to 44 diopters in the right eye and 47 to 48 diopters in the left, or vice versa.

I judge each case on its own merits. I take into consideration the patient's occupation, objective findings and comparative subjective findings. I balance all these with the tonicity indications and write my prescription from them. I have the patient wear the findings, which I find will be most adaptable, in a clinical frame at my office for a considerable length of time to test out their effect. I try to divert the patient's mind from thinking of the glasses before the eyes as of test glasses, by having him read a magazine, or by engaging him in a conversation. I turn my office for the time being into a laboratory, and my patient is the subject under observation, only I don't give him a chance to think of it. After a while I casually remind my patient that he wears glasses in my frame and ask for the effect they made. There is seldom any alteration needed.

DR. WM. SMITH,
1107 BLUE HILL AVE.,
DORCHESTER, MASS.

CONVERGENCE AND ACCOMMODATION*

F. McFadden, Opt. D.
Rutland, Vermont

Accommodation and Convergence are related in action, but this relationship varies in different individuals, and in the same individual is undergoing constant change. (Needles.) Coming down to actual figures, it is theoretically apparent that the total amount of relative accommodation is equal approximately to 40% of the amplitude still unused, and the negative relative accommodation to about 40% of that which is in use. In practice we find that these proportions are modified somewhat by other factors. What is true of accommodation is also true of convergence, that not more than 40% of its total amplitude can be comfortably sustained, so that the limit of sustained convergence coincides with that of sustained accommodation. Beyond that point both are difficult to maintain, difficult in combination, equally difficult independently, which is to say: beyond that point it is hard to sustain normal accommodation-convergence, and equally hard to exercise accommodation or relative convergence. (Atkinson & Woll.) Whatever may be true of other associated brain centres it appears that the ciliary muscles and the convergence centre can have associated impulses run only in one direction, that is from the former to the latter (Savage) so that convergence can rarely, if ever, induce accommodation. (Atkinson & Woll.)

Convergence without accommodation is possible. Accommodation without convergence is possible. (Leventhal. Optical Journal, Nov. 30th, '28.) These facts have been known for many years, but are briefly and conclusively shown by this writer, in a series of easily conducted experiments which anyone can make, and which most Optometrists have made a great many times.

Quoting Leventhal: "Is accommodation without convergence possible? I determined upon a series of experiments, the subject being an intelligent young hyperope, made fully aware of importance of following instructions and giving precise answers. *Theory:* Having created a condition in which convergence-function is suspended, then if accommodation ceases to function, accommodation without convergence is impossible; if accommodation continues to function, then accommodation without convergence is possible. *Experiment:* Subject's V. A. without correction was O. U. 130%. With +1.25 D. Sph. before each eye, fogging method, V. A. was still 130%, but slight additional plus produces blur. Subject is therefore a hyperope of 1.25 and must exert this amount of accommodation to see clearly at 15 feet. With +1.25 D. Sph. in place, subject fixing upon type at 15 feet, base-in prism power in equal amounts before each

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eye was gradually turned on until diplopia ensued, then reduced just enough so as to make fusion barely possible. Subject was now ready for the second part of the experiment. With plus lenses we have suspended accommodation for this particular distance, and by reducing this plus amount we can bring into play any amount—within limits—that we may desire; moreover, should it attempt to function unbidden, we become aware of it immediately, by the blurring effect upon the line of type. With prism base-in we have suspended convergence at this particular distance, because with base-in prism eyes must diverge in order to maintain fusion, and any attempt at convergence causes diplopia.

"If accommodation without convergence is impossible then in this experiment where convergence is suspended, the removal of plus should leave the eyes in a condition of absolute hyperopia, and V. A. of necessity materially reduced; if on the other hand accommodation without convergence is possible, then the removal of plus should bring back the eyes to their previous condition of *latent* hyperopia overcome by accommodation, and V. A. as keen as ever. The second step was devised to give the answer.

"With subject in position of first part of the experiment, plus power was gradually reduced to zero, at which point there was no diplopia, and no blurring of the 15 foot line. Minus power was then turned on and it took —0.50 D. Sph. to blur the 15 foot line, showing that suspension of convergence did not produce suspension of accommodation. CONCLUSION: *Accommodation without convergence is possible.*

"Is Convergence without Accommodation Possible? *Theory:* Having created a condition in which accommodation-function is suspended, then if convergence ceases to function, convergence without accommodation is impossible; if, however, convergence continues to function, convergence without accommodation is possible. *Experiment:* Same as in previous test. Plus power persistently crowded on until with plus 1.75 D. Sph. the 15 foot line was barely readable. Prism base-out, equal amounts before each eye, gradually turned on, subject being cautioned to report any blurring of the 15 foot line. No blurring reported until the moment of diplopia. Now, plus was crowded to the limit, the exertion of accommodation must blur the type; and with prism base-out, the eyes must converge in order to fix the object on the maculas. Hence if convergence inevitably produces accommodation, then in the experiment, the type should have blurred and become indistinct; but as this did not happen, we may assume that accommodation did not take place; therefore:

"Conclusion: *Convergence without accommodation is possible.*"

Wells, in "Stereoscopic Development of the Fusion Faculty," describing the Wells phoro-stereoscope, shows that if the fixation object in the form of stereoscopic cards are placed at 10 cm. distance, with +10.00 D. Sph. lens before the eyes, the subject having been rendered emmetropically correct, and with rotary prisms before the eyes, the prisms can be rotated to the ultimate value of 60Δ while the decentering adjustment of the cells can be made (since 1½" lenses are used in these cells) so as to add 20Δ more, or a total converging value of 80Δ. It is a principle

of psychology that equal efforts do not always produce equal results, and the following combinations are possible:

(1) Equal efforts produce equal results.
(2) Equal efforts produce unequal results.
(3) Unequal efforts produce equal results.
(4) Unequal efforts produce unequal results.

It would seem, in view of the facts heretofore briefly given, but which have been worked out with greater care by other experimenters, to deduce a formula in which a slight convergence-impulse, amounting to from 1Δ to perhaps 5Δ or 8Δ would satisfactorily account for accommodative errors, such as pseudo-myopia of a diopter or so, where the ratio of a possible 80Δ to that of the usual accommodative function must lie. We are perfectly familiar with the fact that these two faculties do work at the same time, and in a sense they function "together"; but that one has a trigger activity over the other is in fact not merely doubtful, it is not actually reasonable—in spite of earlier conceptions and much modern theorizing. It is a physical and a psychological fact that we hear best when we see well, that audition is much keener, more discriminatory, quicker, more adept at interpreting sounds and analysing combination of time when vision is stimulated. It is also a fact that we can—and frequently do, close the eyes when we wish to give special heed to tonal qualities.

It is also a fact that the color or tone of visual impressions such as is readily produced by placing certain tinted lenses, such for instance as amber, before the eyes, will apparently raise the pitch of tone, making the mind function to tonal appreciation as though the number of vibrations were appreciably raised. Here, of course, the association of vision and sound is such that an increase of the functions occurs. These experiments have been well known for a long time. The association areas of the brain, being joined for the purpose of adjustment of the mind to various stimuli, has created a state which is wholly comparable to that between the accommodative and convergent functions of vision, but it is merely an associative relationship, one suggestive of the other, not compulsory by any means. We cite these well known facts in a general way merely by way of mentioning extraneous associative functions to visual impressions. Pascal also wrote interestingly in the Optical Journal some years since upon this topic.

Howe, in his work on Muscles of the Eye, graphically shows the close association of the Edinger-Westphal nucleus which has direct control over accommodation (there being a nucleus for each ciliary body), with the nucleus of not merely the III nerve, but the levator, inferior, superior, and oblique. We are altogether too loose in our thought of the intimate connection of the E-W nucleus and the III nerve without also giving full weight to the associative acts which almost invariably accompany, to some degree in many cases, to a great degree in other cases, and very extensively in definite cases, the associative innervations of these latter nuclei. To be more specific: the act of looking downward is fully as stimulative to the act of accommodation as is convergency. Once more: we stimulate accommodation by a movement roughly described

as "blinking," which in reality is a stimulation of the orbicularis, coming at the same moment as another parallel impulse which contracts the sphincter irid. To look downward, as at an object in hand, is far more stimulative to accommodation than when some object is held high up, or even at the horizontal plane at an equal distance, although the convergence or innervation be merely the III nerve, required in either case would be equal.

If accommodation and convergence are so intimately linked, so indissolubly associated, and to the degree or extent which sometimes is claimed for them, how are we to explain away various conditions which presbyopia introduce? How are we to explain those conditions of a large number of young people whose accommodation, while being normal under stress have little or no accommodative sustaining power, accommodative endurance would be a better word? Or those cases of amblyopia ex anopsia, the eye being unable to function either in convergence, or to accommodate under stress, and having practically no accommodative endurance whatever?

The real fact of the matter is that this branch of refraction started off on the subject with the wrong foot foremost. We early jumped to a conclusion, and for years and years we have been turning facts and conditions inside out for explanations, excuses, plausible theories and speculations to account for other suppositions, some of which did not exist at all, except in imagination, others only in a measurable degree. It is sometimes better to throw overboard a whole set of facts, begin at the foundation and rebuild solidly, forgetting as much of our previous and oftentimes highly erroneous knowledge as possible. The table of accommodation according to age is one such erroneous and highly dangerous not to say speculative "fact." When the idea of accommodation-convergence was first promulgated we had little or no conception of certain biological facts now well known, derived from embryology, comparative anatomy, histology, and neural research. It is far more difficult to overcome error and replace it with truth than to build from facts without the earlier misconceptions.

Accommodation is a new experience in animals, little developed in creatures below primates, although functioning to a limited degree.

Macular vision is a new and specific kind of sight, this, too, known to only a few order of lower creatures than primates, although there is probably some attempt at foveal vision in some creatures. Some birds have been shown by Casey Woods to have two macular areas, but there appears no certainty of foveal vision. In reality the eye which has developed a macular vision is a duplex optical instrument, the cornea, iris, crystalline, and media acting in a double capacity such that field vision discriminates widely for movement of objects, and coloration, while not being discreet. Here the elements of the retina are considerably separated, there being relatively few cones, and these being functionally attached to a neural fibre so that several undoubtedly stimulate one fibre. In the macular area, however, each cone has its distinct and sole nerve fibre. The cones of the macula, particularly at the fovea, are so tightly packed that we have in effect microscopic vision whereas field vision is

macroscopic. The tight-packing of cones gives us a new and hitherto unknown sort of sight to anything hitherto experienced by lower orders. And this macular vision has its counterpart in the calcarine fissure of the cuneus, whence association fibres extend outward to the whole hind brain.

Rotation of the eyes is common to all mammals, birds, fishes, but true concomitancy does not exist until there is a forward placement such as we find in the felines. They have a certain ability to converge, albeit quite limited, since they have no macular vision, only something which serves their purpose probably much better—a sense of the movement of objects probably much keener than that of Man. But the factor of convergency has lately come to recent types of creatures, only been necessary within recent ages of time, and is even now only haltingly developed in the highest creatures. Nature is ever slipping back to early types, and this is well exemplified in our own difficulties and defects.

Macular vision, more specialized in foveal vision, is new. Convergence is new, but specific convergence so as to obtain "two corresponding points" is recent—and yet unstable. The convergence—accommodation of objects at varying angles from the median plane, and of objects at varying distances, as well as the combination of these positions and distances, calls for faculties none too well grounded in the best of us. Suspenopsia is one of these manifestations. Defects and deficiencies occur repeatedly in our daily work of refraction, wherein accommodation does not function in a satisfactory manner; and likewise vergency has its vagaries which give much discomfort, annoyance, distress. But these functions are two entirely dissimilar, unlike, unagreed, often somewhat antagonistic faculties which have grown up at different times, in unlike types of creatures for their own specific problems, unrelated in practically every way. One certainly has not been the offspring, or the hand-maiden of the other. The time has only recently, very recently, arrived when they have in some limited degree become partners. To treat one in terms of the other is illogical in the extreme. Each must be handled as though the other did not exist, as indeed it often does not exist, or has ceased to function, perhaps has lost its activity.

The fact of having some degree or form of excessive vergency, or incompetent vergency, in a manner calculated to influence the accommodative function, either towards inhibition or increased activity is an absurdity. Indeed the reported cases of overcoming myopia to some degree by means of prisms or prismatic exercise thus far seem to be cases whose manifest error did not greatly exceed a diopter or a diopter and a half. If it is possible to attain by exercise upon the convergent faculty from 40 to 70Δ, it would seem entirely reasonable, with all this latitude, and provided there were anything in the theory, to overcome much greater amounts of myopia. But from the fact that the reported reductions of this error have

thus far been small, it looks as though the exploitation of the faculty of convergence merely had an inhibitatory power over the natural tonus of the ciliary muscle itself, to practically the same extent, and certainly no more than a partial or complete cycloplegia, which ranges from about a half a diopter, in some cases, to one diopter, with an occasional diopter and a quarter or half. The ophthalmologist who uses some of the solutions of atropine, when he obtains complete paralysis, allows for a returned tonus a diopter to one and a half diopters. As a matter of fact this looks fairly reasonable, that these two functions are co-operant to just about this extent, and not more. We do know, beyond the peradventure of doubt that myopic eyes have certain very definite characteristics, one factor being a highly elongated, even protuberant eyeball. The focal length of its lens-system, the corneo-crystalline elements, being far less than the depth of the chamber, is established, as is well known; but another equally well known condition, shown repeatedly by the histologist is that the ciliary muscle of the myope is undeveloped. This fact is even more clearly proven by the limited accommodacy, particularly the accommodative endurance, of the myope, under careful check test conditions. These facts have been well known, carefully established and proven without contravention.

Fusional-convergence is another more or less uncertain, possibly vague, at least indefinite term which has come lately into prominence. In some articles it would almost seem that the author were minded to ascribe to "fusion" a new power, a third factor, a definite amount which could scarcely be accounted for by the sum of accommodation and convergence alone. The term is subtle, but are we not ascribing a power to a mental concept of fact rather than a physical condition?

It is true that only the mind sees, and our perception of the external world is arrived at in a variety of ways, sight being largely responsible, but supplemented by audition, touch, and a most uncanny remembrance of things long ago forgotten by the volitional part of memory, but rising to consciousness upon application of variously received and suggestive stimuli. Fusional-vergence-accommodation, as a third faculty is merely another way of expressing association from one convolution of the cortex to another. With the arrows and the ring of Wells, or the two arrows of the church spire, pictures which lie in a plane of the card, rise from this plane because their points fall upon corresponding retinal points, and because of these stimuli they recall, because of associated things in the external world, the condition of objects of like nature, thus standing in bold relief. If the individual had never beheld these objects, or those of similar nature, before seeing the arrows on the card he would have no association whereby to conjure up third dimensional mental concepts. Fusion is merely another way of expressing memory thru the channels of association, one memory-convolution to another memory-convolution, a comparison of present pictures and previous impressions. Suspenopes, even though they receive splendid retinal images, but having rapid alternations. or long lapses of mental (psychical) vision, have extreme difficulty in per-

ceiving depth, or distance in stereoscopic cards. And, needless to say, those who have not a developed fusion faculty have an improper perception of distances, even if they really understand perspective at all, which is often doubtful. They are in fact binocular, but have frequent or long periods of monoptralcy.

For decades we have thought, talked, written, acted, upon the supposition that there were "muscular" deficiencies because of which eyes were not orthophoric. The writer has long contended that an eye which could perform its versions, inward, upward, downward, outward, to any reasonable degree had no "muscular troubles" but that such eyes were improperly innervated; that we should cease thinking in terms of *muscular* delinquencies, but consider that the errors were due to lack of neuricity; that we should study more than merely the eyes and their immediate musculature, but go back into the "power plant" itself, study the brain far more than we do the eyes, and institute other procedures than those we have habitually used. This broadens the scope of Optometry ten or a hundredfold, opening a vast field for practice.

For a long time, indeed almost as long as we have worked unintelligently ,almost as unintelligibly, with the erroneous thought of the control of the ciliary muscle by that of the extrinsics, and vice versa, the whole subject has been quite intangible, thought and procedure was indefinite, and our decisions have lacked conclusiveness. As a matter of fact we ought soon to rid our minds of much of the incubus of early misconceptions and relay our thoughts upon the subject more logically. Instead of considering the eye and its brain connections as a simple optical instrument, we should regard it as a double optical device, its field vision having certain distinct attributes from that of central vision with its direct connected nerve transmission to the cuneus, its tightly packed cones, individually connected, having no rhodopsin, little sensitivity to movements of objects, and not specifically color appreciative. Peripheral vision is what we have inherited as the most primitive sort of ocular stimulation, sensitive first to the presence of light as distinguished from darkness, later stimulated by the movement of objects which caused a shadow to pass across this wide field, still later to be followed by an appreciation of an increase of this shadow area which would occur upon approach, a decrease of the shadow area by recession, and both accompanied by an appreciation of safety or danger in consequence of the direction of such motions upon its screen. Discriminating vision began early in a field we now know as peri-foveal, a narrow ring round the fovea being much more sensitive to movements than the fovea-centralis itself, as Sir John Huxley discovered in looking through his telescope at faint stars, since he could perceive the twinkling of the star extra-Foveally when the light of the star was wholly unappreciable, foveally. It is certainly not in the eye where these delicate analyses are made but in definite areas of the brain itself, although the eye must be both focally adapted and properly oriented.

Bearing now more particularly upon the association of accommodation

to the movements of the eyes, some experimental works carried out by Dr. Guy Thomas Bullwell, of the University of Chicago upon "Fundamental Reading Habits, A Study of Their Development," also by W. R. Miles and Eugene Shen of Stanford University, upon "The Photographic Record of Eye-Movements in the Reading of Chinese in Vertical and Horizontal Axes." Briefly: Fixations of one eye only, during the time required to read one line of newspaper type, were shown to vary from about 18 to 40 per line. The experiments were conducted by projecting a light upon the cornea while it was fixing, and moving to next position, a moving picture camera recording the fixation periods. From data thus arrived at, and other sources, it now seems strongly probable that we have entertained an entirely erroneous conception of the term "fixation." Gould's Dictionary probably gives this as concisely as anyone could: The point at which accommodation of the eyes is adjusted. Our usual conception of the act is that the eyes are focalized, either naturally or by assistance of lenses, or both, after which both are oriented to point precisely at some definite point, when—and when only, as we conceive it—appreciation of the object is possible. After this has been attained, the summation of this act finished, the apex moves forward to some other point, and so along the line, or at whatever object we regard. We conceive that the eyes "hop" along, tightly harnessed, rigidly maintained, directed positively, and in absolute unity. The probabilities are that this is all wrong, merely another supposition unwarranted by fact. Nearly everyone whose eyes we really examine shows a characteristic esophoria or a characteristic exophoria which is as much a part of their personality as their weight, height, hair, color of eyes, or complexion. It is as much a portion of their personality, their characteristic manner of seeing, to have one eye lead off, the other step-up-to, then the leading eye again lead-off, as it is for them to walk. Seeing in reading, seeing in our occupation, is not accomplished by point-fixation at each position, but by one eye stepping to position, followed by the other eye. An exophoria which one has been accustomed to use, other factors being in accord, is as natural, as normal, as proper for one person as is an esophoria of a limited value, to another. It is of course conceded that an excessive amount of esophoria or exophoria may be a disturbing factor in vision, but who shall say that 1Δ, or 3Δ, or 4Δ, of esophoria or exophoria is wrong, should be overcome by exercise or included prisms, based solely upon empiric rules? A comparative condition is that of hyperphoria. We have for many years been instructed, and confidently believed, that hyperphoria should be discovered and corrected, even down to half or quarter diopter of "error," yet how often, upon "correcting" amounts even as great as 4Δ or 6Δ we have introduced an ocular disturbance which could not be overcome until this disturbing prism was either all eliminated or cut to a small fractional value. We would not say that hyperphoria should be left uncorrected, but we do say that it must be handled with both gloves and caution, frequently with a very soft pedal. It is often closely linked up in a most intimate and unsuspected manner with accommodation, so

that its false "correction" introduces all manner of other ocular disturbance and discomfort.

Do the eyes, in "fixing" *walk?* In walking, do they step one ahead of the other as we walk with our feet? Or in fixation upon type or our work, as well as upon objects which are in motion, do we use the "hop-step?" In going down to the next line, in reading, do we fixate below on a rigidly converged apex, point fixation, or does one eye seek, followed by the other? If we turn our sheet of reading matter at 45°, holding the head vertically meanwhile, we experience no particular difficulty in following long lines of type, nor any more on going back for the following line, both of which acts involve high complications of movement, and would be well nigh impossible with rigid fixation, point fixation, but is easily accomplished by perfect flexibility.

We are over-emphasizing esophoria and exophoria, zealously introducing things which either do not exist, or exist with Nature's positive decree of being right for that person. In the lesser amounts we are not merely borrowing needless trouble, we are deliberately creating it out of a misconception of the high flexibility of the faculty.

Prisms and prism treatment, wrongly introduced or employed, may be habit forming to a deleterious degree, and with more unpleasant consequences than if left entirely out of our therapy. But on the other hand, prisms and prism treatment, when essential are as necessary for comfort as are lenses. Do not be concerned in the least because this patient exhibits a small esophoric or exophoric condition previous to focal corrections with a different status after such focal corrections. Be not concerned either because there is an esophoria at distance and an exophoria at near, and neither because there is an exophoria at remotum and an esophoria at proximum, whether before or after focal corrections. We have yet, I believe, no authority of any kind whereby we may lay out a set of laws, rules, procedures, and state with definite words: Thus and so we find it —be it therefore made perfect by this or that orthoptic therapy.

Merely from the fact that a consultant shows, previous to the emplacement of a refractive correction, an exophoric state, does not warrant excessive or full minus correction or a reduction of plus power; nor does the exhibition of an esophoria warrant the reduction of indicated minus needs nor the crowding on of plus power, endeavoring thereby to induce convergence to do something outside its purpose. Moreover, the emplacement of full refractive corrections often change the nature of poise from a small exo to a small eso, or *vice versa,* but again this is no warrant whatever for our changing the indicated focal power from that which gives comfortable and clear vision, under the vague supposition that by so doing we are performing some mysterious rite to ocular poise. In reality, poise is a relative term, not merely with reference to a rather slight and indefinite association with accommodation, but primarily with the tonus, the habit, the characteristic, the mental and physical make-up, the method of the individual in his manner of fixations.

Our very method of "testing" for poise, with the maddox rod or

maddox prism, presupposes that the eyes verge to some definite, some fixed, precise point, and that having thus placed themselves the angle of apex becomes locked. This is a mere supposition, one which has not been borne out by careful checks. We have been instructed that this locked apex angle rode along our type, the locked eyes first fixating upon this, that, and the next point until the end of the line, after which it was placed upon a point of the next line, the act to be repeated by a considerable number of such fixations all during our reading; or that this locked apex angle was as definitely fixed in our occupations, and pastimes, even extending to infinity observation. It is true that the rod and prism test would seem to indicate a rested, still, unmoving attitude, but on the other hand, there is, in such test, nothing to stimulate activity, and it merely becomes static in all respects.

If one will but watch very closely the behavior of many consultants' eyes while observing them under magnification by the keratometer, one will note how they dance about, moving not merely along horizontal, but in slightly vertical and oblique directions. The consultant is unable to still these movements, they are as characteristic and definite as any other involuntary, and therefore unconscious, act. Give the eyes some work to be accomplished, a series of fixations, and they will act with considerable independence of action, not unlike the picking up of an object by one of our hands and then handing this object over to the other hand while the former again grasps an object.

To lock the eyes at an apex point previous to reading would not be unlike clasping our hands together before reaching forward to grasp objects, picking up, moving about, and releasing the object with the hands thus locked. And, to carry the simile yet further: we might imagine our progress upon the ground by first taking a military attitude with heels tightly pressed together, toes at angles, after which we were to move along the ground by hopping. True enough, it might perhaps be done, but it isn't. To place prisms in such manner as would hobble the free movement of the eyes would be like tying the hands or feet, or connecting together with loops which would only leave a small amount of play.

After over thirty-five years in optometry, having run the whole gamut of applied prisms in their various powers and positions, together with the several "exercises" and treatments, whatever those things may mean, the writer has had by far the best success after realizing that convergency and divergency are only relative terms, which vary over considerable angular magnitude between different individuals, and even with the same person under different circumstances, leaving the eyes to make all usual adjustments in the manner which is characteristic with the consultant, and prescribing prisms after most exhaustive investigation, when there could no longer be doubt of the need of a small power.

DR. F. MCFADDEN,
34 CENTER ST.,
RUTLAND, VT.

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EDITORIAL STAFF

DR. CAREL C. KOCH, Editor
209 Medical Arts Bldg.
Minneapolis, Minn.

DR. JACK I. KURTZ, Associate Editor
209 Medical Arts Bldg.
Minneapolis, Minn.

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AN OPTOMETRIC RECORD CHART

We are presenting to our readers on the following pages a complete record chart covering, we believe, every phase of optometric diagnostic procedure. This chart is so arranged to enable the optometrist to quickly record any and all diagnostic data as the examination proceeds and has adequate spaces for recording the findings of the post-refraction as well as such recommendations which may be made for treatment work. Space is also provided for notations regarding the material prescribed as well as space for data relative to fees, etc. The chart as shown on the following pages is in use at this time in the writer's office and is reproduced at the request of many who have seen a small part of it in the March, 1930, Journal and who requested that the entire Case Record Chart be published. As was said in the March issue of this Journal, it is interesting to note that there is today a growing tendency among optometrists to have a specially trained assistant present in the refracting room while the examination is taking place. This assistant prepares the patient for examination; places the apparatus in proper sequence, adjusting same to proper height and P. D., and also usually records the findings as the various tests are made. In using the following record chart the examiner would merely memorize the printed data on the chart which would be held by the assistant and as the examination proceeds would quietly announce to the assistant point after point, the assistant recording the data at once while the findings are being made.

C. C. K.

CASE RECORD CHART. Dr. Carel C. Koch.

Rx No..... Date....., 193.....

Patient .....

Address .....

MATERIAL PRESCRIBED *Distance Correction*

O. D.....Sph.....Cyl. Axis..... ⌒ .....Prism. Base.....

O. S.....Sph.....Cyl. Axis..... ⌒ .....Prism. Base.....

Bifocal Addition: O. D..... O. S..... O. U.....

Reading Correction

O. D.....Sph.....Cyl. Axis..... ⌒ .....Prism. Base.....

O. S.....Sph.....Cyl. Axis..... ⌒ .....Prism. Base.....

Type of Bifocal: Ultex..... Kryptok..... No Krome..... Opifex..... Cement.....

Height of Bifocal Segments.... Displace segments in O. D.....m/m. O. S.....m/m.

Lens Tint: Crooks..... Softlite..... Colonial..... Regular..... Boston.....

Lens Size: Oval..... Round..... Leaf..... Use former No.....

Lens Form: Flat..... Toric..... Corrected..... Skel..... Insert.....

Holes to pair—2-3-4 Drill above..... Drill on line.....

Riding Bow—Frames and Mountings Prescribed—Eye-glass

Type..... Bridge..... Type..... Bridge.....

Temple length..... Style..... Guards..... Rims.....

Angle of crest..... Rims..... Chain..... Cord..... Reel.....

P. D.....+.....=.....m/m. Type of Face.....

Notes .....

.....

.....

Refer to Rx No..... for Rx of.....Glasses. Refraction Fee.....

Glasses to be finished..... Dispensing Chg.....

Deposit .....

This Rx written by Dr.....Opt. D. Total Charges.....

CASE HISTORY

Occupation..... Age..... Speaks.....only

Nationality..... Place of Birth.....

Data regarding parent's vision.....

Health and vision during childhood..... Measles..... Scarlatina.....

Condition of eyes at start of school.....

Accidents or diseases relating to eyes..... Catarrhal Conjunctivitis.....

Age at start of wearing glasses..... Number of years glasses worn.....

Do your eyes disturb your distance vision..... Near vision.....

.....

Onset: Present trouble began about.....years.....months.....weeks.....days ago

At what distance do you do your work..... Hold your reading.....

Posture while at work.....

Light conditions while at work..... Effect of artificial light.....

Do you become drowsy while doing close work..... Type blur.....

Have you headaches..... Suffer from asthenopia.....

Location of headaches: Frontal..... Temporal..... Vertex..... Orbital..... Occipital.....

Type of headaches: Dull..... Constrictive..... Pulsating.....

Time headaches occur: A. M..... P. M..... After close work..... After cinema.....

Do you now or have you ever suffered from squint..... When first noticed.....

Was the squint occasional..... Periodic..... Permanent..... Nystagmus.....
Do you suffer from nausea or dizziness at home..... While on cars.....
Subject to Granular Lids..... Inflamed Conjunctiva..... Hordeolums.....
Subject to Epiphora..... Diplopia..... Photophobia..... Muscae Volitantes.....
Condition of ears..... Condition of teeth.....
Condition of nose..... Nasal Catarrh..... Sinus Trouble..... Asthma.....
Condition of Throat..... Bronchial Catarrh..... Tonsillitis.....
Condition of Stomach..... Condition of Nerves.....
Condition of General Health.....

.....

At present time under the care of Dr.....for.....
Patient referred by Dr..... Patient referred by M.....
Data regarding appetite..... Regarding food consumption.....
Regarding rest..... Regarding bathing.....
Regarding exercise..... Regarding excretion.....
Regarding the use of stimulants, with the approximate amount used per day.....
Tea..... Coffee..... Tobacco..... Alcohol..... Drugs.....
Patient's height..... Patient's stature:—Emaciated..... Normal..... Obese.....
Patient's apparent mental attitude:—Nervous..... Normal..... Phlegmatic.....
Patient's apparent health:—Weak and tired..... Active and strong.....
Patient's complexion:—Light.... Dark.... Patient's hair:—Blond.... Brunette.... Gray....
Condition of patient's skin..... Breath..... Oral cavity.....

PREVIOUS CORRECTION

In use.....years, for..... Prescribed by Dr.....

O. D.....Sph.....Cyl. Axis..... ⌒ .....Prism. Base.....

O. S.....Sph.....Cyl. Axis..... ⌒ .....Prism. Base.....

Bifocal Type..... Addition, O. D..... O. S..... Visual Acuity, O. D..... O. S.....

VISUAL ACUITY UNCORRECTED

Acuity taken with Standard Test Type. O. D..... O. S..... O. U.....
Acuity taken with.....Test Type. O. D..... O. S..... O. U.....
Acuity taken with Pin Hole Disc. O. D..... O. S..... O. U.....
Acuity taken with Stenopaic Slit. O. D..... O. S..... O. U.....

THE COVER TEST

O. D. ..... O. S.....

UNCORRECTED PHORIA TEST AT 6 METERS. Time taken.....

Esophoria..... Exophoria.....

VERSIONS

O. D..... O. S..... O. U.....

EXTERNAL OCULAR INSPECTION

General Appearance of Eyes..... Orbits.....
Position of Eyeball: Deepseated..... Normal..... Protruding.....
Cover Test..... Strabismus, O. D..... O. S..... Strabismometry, O. D..... O. S.....
Nystagmus .....
Eyeball: Size..... Lack of symmetry..... Intraocular Tension. O. D..... O. S.....
Lids: Palpebral Fissure..... Ability to move, O. D..... O. S.....
Blepharospasm..... Ptosis..... Ectropion..... Entropion.....
Condition of Skin covering..... Hordeolums..... Chalazion.....
Condition of Lid Edges..... Granulations..... Ulcerations..... Scabs..... Puncta.....
Condition of Lashes..... Number..... Ptilosis.....
Region of Lacrymal Sac..... Buldging..... Excretions.....
Conjunctiva of the Lid and Fornix..... Transparency..... Thickening.....
Color..... Surface..... Scars.....

Bulbar Conjunctiva..... Transparency..... Thickening..... Color.....
Ecchymosis, O. D..... O. S..... Pterygium, O. D..... O. S.....
Sclera ..... Stained..... Clear.....
Cornea: Size..... Form..... Arcus Senilis.....
Condition of Epithelium..... Opacities..... Scars.....
Transparency..... Inflammation..... Ulceration..... Reflexes.....
Vascularization..... Sensitiveness..... Foreign Bodies.....
Anterior Chamber..... Depth..... Clearness..... Contents.....
Lens: Present..... Absent..... Position..... Color.....
Iris: Position..... Color, O. D..... O. S.....
Malformations..... Adhesions.....
Pupil: Size, O. D.....m/m., O. S.....m/m. Shape..... Position.....
Response to Light, O. D..... O. S..... Response to Accommodation.....
Data on Previous Ocular Surgery.....

OPHTHALMOSCOPIC EXAMINATION

O. D. Sketch of Opacities O. S.

Condition of Vitreous.....
Condition of Lens.....
Condition of Posterior Chamber.....
Condition of Iris.....
Condition of Anterior Chamber.....

Fundus Notation—Right Eye

The disc is {round / oval / elliptical} {in shape {pale / medium / dark}} rose reddish in color, with a {broad / medium / narrow} {{clearly / average / poorly}} defined edge, the tendency being to merge off towards the {up or lower / nasal / temporal} side. The cup is {small / moderate / large} it being {very easy / easy / difficult} to see, and is {very deep / average / shallow}. The choroidal ring shows {very strongly / clearly / faintly} on the {nasal / temporal / up or lower} side, with the scleral ring showing at the..... The vessels are approximately..... in number, their course being.....and their pulsation quite {absent / moderate / marked}. The macular region is {very easy / easy / difficult} to discern, the general color being a {pale / medium / dark} reddish, with {one / no / (?)} {small / medium / large} bright foveal dot being visible. The general fundus color

is of the { feeble / moderate / pronounced } { blonde / brunette / very dark } type. The outstanding features of this fundus being as follows.....and have been sketched above.

Fundus Notation—Left Eye

The disc is { round / oval / elliptical } in shape, { pale / medium / dark } rose reddish in color, with a { broad / medium / narrow } { clearly / average / poorly } defined edge, the tendency being to merge off towards the { up or lower / nasal / temporal } side. The cup is { small / moderate / large } it being { very easy / easy / difficult } to see, and is { very deep / average / shallow } The choroidal ring shows { very strongly / clearly / faintly } on the { nasal / temporal / up or lower } side, with the scleral ring showing at the..... The vessels are approximately..... in number, their course being....., and their pulsation quite { absent / moderate / marked } The macular region is { very easy / easy / difficult } to discern, the general color being a { pale / medium / dark } reddish, with { one / no / (?) } { small / medium / large, } bright foveal dot being visible. The general fundus color is of the { feeble / moderate / pronounced } { blonde / brunette / very dark } type. The outstanding features of this fundus being as follows.....and have been sketched above.

SPHYGMOMANOMETER FINDINGS

Systolic..... Diastolic..... Pulse Pressure.....
Result..... Time Taken.....

TRANSILLUMINATION

O. D. .....
O. S. .....

COLOR VISION

Technic employed .....
O. D. .....
O. S. .....

PERIMETRY AND CAMPIMETRY

Charting the peripheral field, using perimeter in Artificial..... Daylight.....
Technique: Visible to Invisible..... Invisible to Visible.....
Irregularities of field of vision, using the McHardy Perimeter
O. D. ..... } Illumination in
O. S. ..... } Foot Candles.....
Apertures used: 10-5-3-1. See attached perimeter charts No..... to No.....
Charting the central area, in Artificial..... Daylight.....
Technique: Visible to Invisible..... Invisible to Visible.....
Irregularities of the central field, using the Stereo-Campimeter.
O. D. .....
O. S. .....
Test Objects used: .05-1.5-3-5-6-10-12. See attached Lloyd charts No..... to No.....

OPHTHALMOMETRIC FINDINGS

O. D. Meridian Measured ..... Dioptic Power.....
Meridian Measured ..... Dioptic Power.....
Resultant Corneal Astigmatism..... Dioptres, Axis.....
O. S. Meridian Measured ..... Dioptic Power.....
Meridian Measured ..... Dioptic Power.....
Resultant Corneal Astigmatism..... Dioptres, Axis.....
Radius of Cornea in m/m with the Universal Ophthalmometer in secondary position when no astigmatism has been registered: O. D..... O. S.....

SKIAMETRY, STATIC

Operating Distance..... Reflex.....
O. D.....Sph.....Cyl. Axis.....
O. S.....Sph.....Cyl. Axis.....

THE FIRST DYNAMIC SKIAMETRIC CHECK TEST

Fixation at..... Reflex.....
O. D.....Sph.....Cyl. Axis.....
O. S.....Sph.....Cyl. Axis.....

The Post Refraction

SKIAMETRY, STATIC

Operating Distance..... Reflex.....
O. D.....Sph.....Cyl. Axis.....
O. S.....Sph.....Cyl. Axis.....

THE SECOND DYNAMIC SKIAMETRIC CHECK TEST

Fixation Distance..... Reflex.....
O. D.....Sph.....Cyl. Axis.....
O. S.....Sph.....Cyl. Axis.....

MONOCULAR CROSS CYLINDER ACCOMMODATION TEST

Fixation Distance.....Cross Cylinder Used.....
O. D. .....
O. S. .....

THE CORRECTED SUBJECTIVE DISTANCE ACUITY OF VISION TEST

O. D.....Sph.....Cyl. Axis.....Visual Acuity, 20/.....
O. S.....Sph.....Cyl. Axis.....Visual Acuity, 20/.....

DOMINANT EYE TEST

O. D. .....O. S.....

DISTANCE COMPARISON TEST

Results: O. D.....O. S.....

DETERMINATION OF THE PATIENT'S VISUAL WORKING RANGE

Patient habitually holds ***reading*** matter at, from.....to.....c/m
Patient's *clerical* work requires a near-point focus of, from.....to.....c/m
Patient's *mechanical* work requires a near-point focus of, from.....to.....c/m
For ***music,*** Patient requires a near-point focus of, from.....to.....c/m

THE THIRD DYNAMIC SKIAMETRIC CHECK TEST

Fixation at the *Reading* distance of.....c/m.
O. D.....Sph.....Cyl. Axis.....
O. S.....Sph.....Cyl. Axis.....
Fixation at the *Clerical Working* Distance of.....c/m.
O. D.....Sph.....Cyl. Axis.....
O. S.....Sph.....Cyl. Axis.....
Fixation at the *Mechanical Working* Distance of.....c/m.
O. D.....Sph.....Cyl. Axis.....
O. S.....Sph.....Cyl. Axis.....
Fixation at the *Music Rack* Distance of.....c/m.
O. D.....Sph.....Cyl. Axis.....
O. S.....Sph.....Cyl. Axis.....

NEAR-POINT OF ACCOMMODATION

O. D. .....O. S.....

SUBJECTIVE POSITIVE ACCOMMODATIVE TEST

Amplitude: O. D.....O. S.....O. U.....
Oculo-Dynamic Treatment prescribed for O. D.....O. S.....O. U.....
Patient to return in.....weeks after exercising Ciliary.....times a day.

SUBJECTIVE NEAR-POINT ADDITION

Add to Distance correction as follows for *Reading:*
O. D.....Sph. O. S.....Sph. Comparison Test: O. D.....O. S.....
Range of Vision with addition, O. U.....to.....c/m. (App. or with Tape)
Add to Distance correction as follows for *Clerical Work:*
O. D.....Sph. O. S.....Sph. Comparison Test: O. D.....O. S.....
Range of Vision with addition, O. U.....to.....c/m. (App. or with Tape)
Add to Distance correction as follows for *Mechanical Work:*
O. D.....Sph. O. S.....Sph. Comparison Test: O. D.....O. S.....
Range of Vision with addition, O. U.....to.....c/m. (App. or with Tape)
Add to Distance correction as follows for focus at the *Music Rack Distance:*
O. D.....Sph. O. S.....Sph. Comparison Test: O. D.....O. S.....
Range of Vision with addition, O. U.....to.....c/m. (App. or with Tape)

CORRECTED DISTANCE PHORIA TESTS Time taken.....

Esophoria.....Exophoria.....R. Hyperphoria.....L. Hyperphoria.....

CORRECTED NEAR-POINT PHORIA TESTS

Esophoria.....Exophoria.....R. Hyperphoria.....L. Hyperphoria.....

DISTANCE DUCTION TESTS

O. D. Abd...../.....Add...../.....Infra...../.....Super...../.....

O. S. Abd...../.....Add...../.....Infra...../.....Super...../.....

NEAR-POINT DUCTION TESTS

O. D. Abd...../.....Add...../.....Infra...../.....Super...../.....

O. S. Abd...../.....Add...../.....Infra...../.....Super...../.....

THE BINOCULAR ACCOMMODATIVE-CONVERGENCE CROSS CYLINDER TEST

Fixation Distance.....Cross Cylinder Used.....

O. D.....O. S.....

DIAGNOSIS

Sketch .....

.....

.....

.....

Signed Dr.....Refracting Optometrist

Signed Dr.....Consulting Optometrist

INITIAL FORMULA PRESCRIBED

Date .....

To be used as a Distance Correction.....or as Treatment Lenses.....

O. D.....Sph.....Cyl. Axis..... ⌒ .....Prism. Base.....

O. S.....Sph.....Cyl. Axis..... ⌒ .....Prism. Base.....

Reading Correction.....Clerical Work.....Mechanical Work.....Music.....

O. D.....Sph.....Cyl. Axis..... ⌒ .....Prism. Base.....

O. S.....Sph.....Cyl. Axis..... ⌒ .....Prism. Base.....

PROGNOSIS

.....

.....

.....

INITIAL INSTRUCTIONS TO PATIENT

.....

.....

.....

Patient to return for a Post-Refraction, Day.....Date.....at.....M.

Explanatory Note:—[The material as presented on this and the preceding six pages, is, when in use, arranged on a loose-leaf record sheet measuring 15½ by 9½ inches. There are three columns on each side of the sheet, which when filed is first folded once. These sheets are filed alphabetically in loose-leaf books. This chart *is not* copyrighted, any of our readers being welcome to use this material.]

C. C. K.

ANNOTATIONS AND SOCIETY PROCEEDINGS

The American Journal of Optometry is the Official Organ of the American Academy of Optometry, as well as the Organ of the Arkansas, Delaware, Indiana, Iowa, Maine, Maryland, Michigan, Minnesota, Nebraska, North Dakota, Oklahoma, Pennsylvania, South Dakota, Vermont and West Virginia Optometric Associations.

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THE "LENS CONSCIOUS" PUBLIC?

Dr. Peter Scholler, optometrist of Hancock, Michigan, and President of the Michigan State Board of Examiners in Optometry, writes interestingly on the sometimes vexatious question of the propriety of advertising optical material direct to the public as is the custom of some of the large manufacturers of material. As a preface to the excerpts of the article which follows Doctor Scholler says:

"Unless warned, the reader of this article may unjustly conclude that the writer thereof was prompted by a fault finding mentality guided by a nonprogressive intellect, unable to recognize and appreciate true merit.

"It is therefore deemed expedient to inform those who will try to analyze the propriety or ill advisedness of the statements made or questions asked, that the writing of this article is inspired solely by a sincere solicitude for the welfare and the progress of professional optometry and the advancement of true science and that furthermore the writer has at all times prescribed the highest grade of precision lenses made: 'punctuals' having formed a large proportion of the prescriptions written by him ever since said lenses have been available. He also has his plano prism corrections whether permanent or temporary, ground on a 6 D. base curve, the only flat plano prisms used being those employed at his office for muscle exercise and fusion training. Hence nothing in this article is intended to cast reflections on the merit of the optical products alluded to, providing, of course, that the scientific merit of these lenses proves in the final analysis to be commensurate to the claims of the manufacturers producing them, but regardless of scientific merit, I feel justified to take issue with the apparently ill-advised attitude of those who by 'Hallabaloo' tactics and old time patent medicine methods are, at least, seemingly attempting to stay in my judgment the progress and forward march of Professional

Optometry and are trying to revert the prescribing of glasses not only back into purely commercial channels but a class of commercialism on a par with the disposal of 'Camels' and 'Lucky Strikes.'

"This article," continues Doctor Scholler, "is furthermore intended to start a friendly, frank, free and open discussion of the scientific merit of the newer precision lenses with the hope that the outcome will be such that dispensers of these much vaunted lenses, whether optometrists or opticians, will not be compelled in the future, as they have in the past, to hang their heads in shame when asked as to the reason why Orthogon or Tillyer lenses are more scientifically correct than all others, and also be able to intelligently answer the questions of honest inquirers as to why both of these lens manufacturers claim scientific superiority for their specific products: one over the other, as being the final and greatest achievement of lens construction ever attempted or accomplished."

Advertising Material to the Public.—"Although Optometry," says Doctor Scholler, "has been legally recognized for more than a quarter of a century in some of the states of our country and is now legally recognized in every state and possession of the United States, every province of Canada, and many other comonwealths throughout the world, manufacturers of Ophthalmic lenses, in spite of the fact that the courts have ruled that physicians while engaged in the act of examining eyes for the purpose of prescribing glasses *'are for the time being not engaged in the practice of medicine, but Optometry,'* have and continue to lend a defective auditory organ to the pleading of optometrists to give recognition to optometry in the literature and advertising matter which said manufacturers issue for the exclusive use of optometrists now are seeking the co-operation of the optometric profession to assist them in making the public 'LENS CONSCIOUS' instead of 'EYE CONSCIOUS,' and request that optometrists who dispense their lens products hide their professional skill behind a phonetic lens name and thus to lead their patients to believe that visual comfort and relief of eyestrain can only be obtained by wearing a certain brand of lens which these same manufacturers surround with the greatest secrecy, grinding them with tools that are numbered by codes so that the actual curves which they claim are producing their *'magic lenses'* should remain a close secret."

"This attitude of secrecy and mystery," continues Doctor Scholler, "on the part of manufacturers may create distrust in the minds of those who cannot comprehend the reason or necessity for such a stand. Suppose the refusal of the manufacturers to take into their confidence those whom they ask to supply the public with these meritorious lenses should cause some one with more spare time than gray matter in his encephalic cavity to arm himself with a curvometer and calliper of mediocre and questionable scientific value and thus equipped attempt to penetrate the mystic labyrinth of lens construction and then and there discover, to the satisfaction of his misguided mind, that because the inner or outer curves of at least 90 per cent of the lenses usually prescribed, *viz.*: Those below three dioptre value, bear such a close relationship to the proverbial six dioptre curve that the so much despised and, at the present time, somewhat ma-

ligned Meniscus and Toric lens might be considered to be a very respectable older brother and sister to these 'younger kids' of the Ophthalmic precision lens family who, it would seem, were bred in the same atmosphere even though they were fed with a superior spoon."

Protection Against Price Cutting a Myth.—"Are the Licensed Dispensers of these lenses protected from price cutting?" asks Doctor Scholler. "I fear they are not, because any person willing to pay the prescription price for these lenses can obtain them from optical dispensaries and even wholesale dealers of 'jewelry' are listing them in their catalogues."

"I have long been convinced," says Doctor Scholler, "of the folly of using trade names and consider it just as ill-advised to placard a professional optometrist's reception room with advertisements of trade named material used in optometric service, as would be the placarding of the reception room of dentist's or physician's office—and if any one of my readers should think that there are no specific preparation devices and paraphernalia for dentists' and physicians' analogous to the lenses and frames used by optometrists, let him look over the periodicals published in the interest of Dentistry and Medicine, and meditate for a moment how a dentist's or physician's reception room would look with the walls covered with placards advertising the specific preparations, auxiliaries and mechanical devices for which each advertiser claims superior merit for his specific products.

Chaotic Condition of Professional and Public Mind.—"Claiming superiority by each manufacturer of the lenses in question of a product which both admit to be of equal monetary value, as demonstrated by a uniform price list, is apt to create a chaotic condition," continues Doctor Scholler, "both in the professional and public mind as evidenced by the following incident:

"The Superintendent of the high school in a neighborhood community recently asked me the question as to which lens would give the best vision, Tillyer or Orthogon, and in the light of the best information which after persistent and repeated efforts I have thus far been able to obtain, I answered, 'That would depend on what distance and position before the center of rotation of the two eyes of a person these respective lenses would be placed.'

"Had I been content with the information voluntarily given by those who claim to know, I might, in order to maintain a well-informed attitude and appearance, been compelled to say, 'That would depend on the brand of cigarettes you smoke and it would also depend on whether you are a democrat or republican, but whether you are wet or dry would not make any difference.'

"Of course, I know that this last remark is gross exaggeration but I hope to be pardoned when I confess that though try as I would, I have found it impossible to figure out the reason why a man cannot recognize weeds when looking through a Toric lens but the weeds are perfectly discernable when viewed through a pair of these modern lenses. Neither can I," says Doctor Scholler, "analyze the scientific reason why Toric lenses confine the wearer to gas-pipe vision while the vision in looking through

the newer brand of lenses is extremely magaphoned.

"Since the manufacturers of these 'each best' lenses have by their actions admitted and demonstrated that their respective lenses are of equal monetary value, and thus justify the conclusion that they likewise are of equal scientific value, and because they are now made and will continue to be so, why not get together," suggests Doctor Scholler, "on a uniform basic construction of these new lenses for which a phonetic name, satisfactory to all concerned, might be adopted or else adopt a uniform phonetic trade name for both of their present products and thus avoid the chaotic condition we are heading for, as indicated by the following few quotations from the Literature published by the manufacturers of the lenses under consideration, half being taken from one source and half from the other."

"In optical correction the ——— compares favorably with the ——— and is superior to every other type of lens known."

"It was not until the ——— lens was introduced that an opportunity for a real progressive advancement was offered."

"——— lenses ΔΔΔ the most practical and desirable lenses which science has yet devised."

"There is no substitute for the accuracy produced by the original calculations for ——— lenses. There is no substitute for the high standards of ——— manufacture and ——— shop procedure."

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CALIFORNIA RESEARCH GROUP

"Northern California is leading the United States in the matter of educational activities, among the various professions," said one of our most prominent Optometrists, who hails from that section, east of the Mississippi.

This was amply shown Thursday night, March 27, 1930, in San Francisco, when the California Research Group in the Science of Vision held its monthly dinner and educational program at the William Taylor Hotel.

Prof. Ralph Minor, Director of Optometry, at the University of California, Berkeley, California, in his opening remarks, said:

"In one of my classes several years ago, I had a beautiful young lady named Charles. Apparently her father had definitely made up his mind what 'his' name would be before she arrived. In contradiction to this case, I once heard of a family who designated their children by numbers until they had reached maturity. At which time the children chose their own names.

"About a year ago, a group of Optometrists in and around San Francisco banded themselves together to attempt to gain more knowledge by asking men in other professions to come to them to tell of the many other physiological and pathological processes correlated and interrelated with refraction and ocular problems. We seriously considered the name of our organization and realized that if some care was not exercised, it would be entirely possible to arrive at a name that implied limitations and made our objective short lived. Finally we chose 'The California Research

Group of the Science of Vision' as a name which is not only descriptive of our objective but also purposely omitted naming any particular profession. In this way, all who have work that deals directly or indirectly with the visual process are eligible to gather together as we have this evening.

"The diversified subjects discussed by the speakers this evening call to one's attention immediately the fact that although these men have specialties that of themselves are far afield from ocular refraction, yet there is an interrelation or affect of the pathology of their work upon the function of the eye. I have been a teacher of physics, and at the present time am holding the nursing bottle to a new Curriculum of Optometry at the University of California. My contract with the work has convinced me that Optometry is like a three legged stool. It rests upon three equally important sciences—physics, physiology, and psychology. It is with the thought of the further exploration of the latter two of these sciences that we have gathered together.

"Not many years ago it was popularly conceded that there were many kinds of electricity—the sparks from a cat's fur, the electricity in a storage battery, and then lightning was something else. But after the discovery of the electron, the whole thing was unified, much progress was made and electricity has become much more useful. At one time, most practitioners of specialties pertaining to physical well-being kept themselves more or less aloof from each other. They were each moving around more or less in water-tight compartments. The wonderful gathering of Ophthalmologists, Bacteriologists, Dentists, Optometrists, Osteopaths, Radiographers as well as many educators we have tonight is proof conclusive that the old time bars are breaking down and all of us feel that we can gain more knowledge and be of greater benefit to our patients through the exchange of information. One man with whom I talked not so long ago, said that he didn't believe there was a 'science of Vision.' With the continued enthusiasm as displayed tonight, I feel quite sure that if there is no 'science of Vision' that we are the kind of people who will make one."

The gathering included Physicians, Surgeons, Dentists, Optometrists, Radiographers, Pathologists, Chemists and many others. Sixty-two were present at the dinner and by 8:00 P. M. a gathering of one hundred and fifty were seated for the lectures.

Louis D. Green, M. D., of the Green Ophthalmic Clinic in San Francisco, gave a "Report of the Medical Conditions in Europe," as observed in a recent five months' tour, with special reference to Russia." His report was given splendidly and brought forth much applause and many questions.

Dr. W. W. Cross, Urologist of Oakland, California, gave a very interesting and instructive talk on "Kidney Pathology," which was illustrated with Autochrome and Photomicrographic Slides.

Dr. Paul Boyens, Professor of Periodontia of the College of Physicians and Surgeons, San Francisco, spoke on "Dental Radiographic Interpretations," which was enthusiastically received.

Dr. H. Marquez gave a short, concise story of the "Schilling Blood

Test for Focal Infection."

All lectures were taken in short hand and will be sent to all members of the group.

Among those present were Prof. Agnes Fay Morgan, Chairman of the Department of Household Science of the University of California; Prof. Frank Green, City Toxocologist; Dr. W. G. Anching Kung, Consul General of China to San Francisco; Dr. G. I. Deane, of the California State Board of Optometry; Dr. W. J. Heather, Instructor of Chromographology at the Pennsylvania State College of Optometry; Dr. W. Bauman of Chicago; Dr. Looser of Lodi; Dr. Sweeney of Stockton; Dr. Louen of Crockett; Dr. T. A. Brombach; Dr. Vance Simonton, Chairman Board of Research Directors acted as Toastmaster.

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NORTHERN INDIANA ASSOCIATION

The Northern Indiana Optometric Association held its regular monthly meeting at South Bend on April 14th. Thirty-five optometrists were present. Dr. W. F. Macdonald reports that the subject under discussion was the "Care of the Eyes of the Child." The next monthly meeting will be held at LaPort on the 12th of May. The "Treatment of Squint," will be the subject treated at this meeting.

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MASSACHUSETTS BOARD OF REGISTRATION

The Massachusetts Board of Registration in Optometry will hold its next examination on June 24, 25, 26 and 27, 1930, at the State House, Boston, Massachusetts. The Practical Examination will include a demonstration of ability to map the central, para-central and peripheral fields. The instruments to be used will include the Ferre-Rand, A. O. Company Perimeter and Stereo Campimeter.

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OKLAHOMA OPTOMETRIC ASSOCIATION

The annual meeting of the Oklahoma Association of Optometrists was held at Oklahoma City, April 21st and 22nd. The first day was devoted to business affairs of the society. Drs. Mendelsohn and Sheppard addressed the convention on the second day.

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BACK COPIES WANTED

The Columbia University Library wishes to complete its files for the year 1929 and is missing the December issue of Volume Six. Any one who can spare this copy is requested to mail it direct to D. B. Hepburn, Accessions Dept., Columbia University Library, New York City.

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BETTER VISION INSTITUTE

Mr. Ernest H. Guant, Secretary of the Better Vision Institute, has announced his resignation from this organization, to take effect May 1st, 1930. Mr. Guant will become Executive Director of the Clothing Manufacturers' Research Board. Mr. M. S. Julian will assume the Secretaryship of the Better Vision Institute.

SOUTH DAKOTA OPTOMETRIC SOCIETY

The annual meeting of the South Dakota Association of Optometrists was held at Mitchell, on the 13th, 14th and 15th of April. Dr. D. N. Smith was re-elected President and Dr. W. H. Fritz was re-elected Secretary. Delegates were appointed to attend the National meeting of the American Optometric Association at Boston and the meeting place for the next convention of the South Dakota Association was decided upon. This meeting will be held in Aberdeen. Professor R. Barstow and Dr. J. Neumiller were the chief speakers at the convention. The convention went on record endorsing and supporting holding the annual convention of the American Optometric Association in the Twin Cities during the year 1931. It also endorsed a move to pass a Glazed Goods Law in South Dakota as well as favoring the establishment of a standard of minimum office equipment for optometric practice. The American Journal of Optometry was again given the support of the Society. This convention was one of the best attended conventions ever held in the state with more than sixty optometrists present.

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STATEMENT OF OWNERSHIP

Management and Circulation as required by the Act of Congress of August 24th, 1912, of the American Journal of Optometry, published monthly at Minneapolis, Minnesota, for April 1, 1930.

State of Minnesota, County of Hennepin—ss.

Before me, a Notary Public in and for the State and County aforesaid, personally appeared Dr. Jack I. Kurtz, who having been duly sworn according to law, deposes and says that he is the Business Manager of the American Journal of Optometry and that the following is to the best of his knowledge and belief, a true statement of the ownership and management of the aforesaid publication for the date shown in the above caption required by the Act of August 24th, 1912, embodied in Section 411, Postal Laws and Regulations, to-wit:

First, that the names and addresses of the Publisher, Editor, and Business Manager are as follows: Publisher, The American Journal of Optometry Publishing Association, 209 Medical Arts Building, Minneapolis, Minnesota. Editor, Dr. Carel C. Koch, 209 Medical Arts Building, Minneapolis, Minnesota. Business Manager, Dr. Jack I. Kurtz, 209 Medical Arts Building, Minneapolis, Minnesota.

Second, that the owner is the American Journal of Optometry Publishing Association—Dr. Carel C. Koch, President, and Dr. Jack I. Kurtz, Secretary and Treasurer.

Third, that there are no bondholders, mortgagees, or other security holders owning or holding one or more per cent of the total amount of bonds, mortgages or other securities of this publication.

DR. JACK I. KURTZ, Business Manager,
The American Journal of Optometry.

Sworn and subscribed before me this 26th day of March, 1930.

MARGARET WILLIAMSON, Notary Public,
Hennepin County, Minnesota.

(My commission expires Jan. 14, 1933.)

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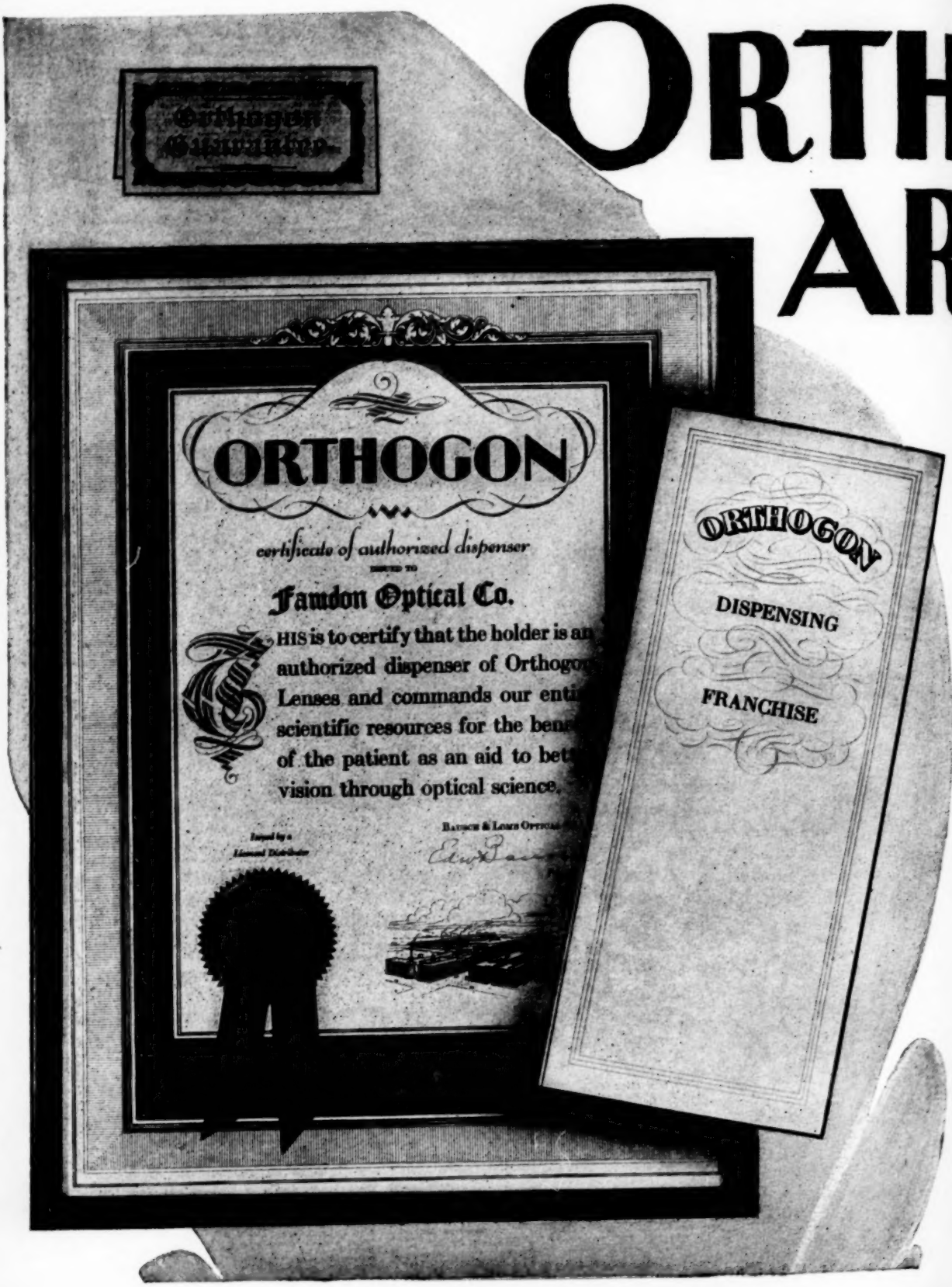

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